

# CosmicSAG Status and Plans

**Cosmic Ray Study Analysis Group**

PhysPAG APS Town Hall, Denver, April 16, 2013

# CosmicSAG Activities

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- ▶ **Committee formed April 2013**

- ▶ John Mitchel (GSFC), Igor Moskalenko (Stanford U), Angela Olinto (U Chicago) Chair, Eun-Suk Seo (U Maryland)

- ▶ **Goals of CosmicSAG**

- ▶ Provide an assessment to NASA HQ and the PCOS program office of the status and the **current and future** needs of the **cosmic-ray astrophysics** community.
- ▶ Act as a **focal point** and forum for the cosmic ray community.

- ▶ **White Paper with Cosmic Ray vision for the next decade(s)**

- ▶ Gather input from Community
- ▶ Survey current and future projects and missions and their science goals and coverage

- ▶ Survey technology development needs for future progress in the field

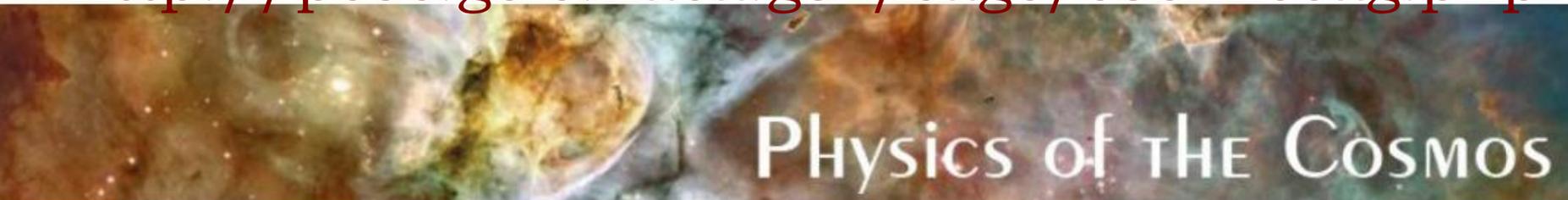
# CosmicSAG Activities

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- ▶ Gather input from Community
  - ▶ “June 2012”: open meeting at CR2012 requesting input from the community
  - ▶ Teleconferences and email input for further information gathering.
  - ▶ Discussion at ICRC 2013
- ▶ Fall 2013: compile/write white paper.
- ▶ January 2014: Circulate to the community for feedback
- ▶ February 2014: Deliver white paper to PhysPAG (+ NAC)
- ▶ Present white paper at April 2014 APS meeting.



<http://pcos.gsfc.nasa.gov/sags/cosmicsag.php>



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**Links**

[PhysPAG](#)

**Study Analysis Groups (SAGS)**

[CosmicSAG \(Cosmic Ray SAG\)](#)

[IPSAG \(Inflation Probe SAG\)](#)

[GWSAG \(Gravitational Wave SAG\)](#)

[XRSAG \(X-ray SAG\)](#)

[GammaSAG \(Gamma ray SAG\)](#)

[TechSAG \(Technology, no longer active as of](#)

[January 2012\)](#)

**Cosmic Ray SAG**

Angela Olinto, Chair — [olinto@kicp.uchicago.edu](mailto:olinto@kicp.uchicago.edu)

The goals of the Cosmic Ray Science Analysis Group (CosmicSAG) are to provide quantitative metrics and assessments to NASA in regard to current and future needs of the cosmic-ray astrophysics community and to act as a focal point and forum for the cosmic ray community.

The CosmicSAG is composed of John Mitchel (GSFC), Igor Moskalenko (Stanford U), Angela V. Olinto (U Chicago) Chair, Eun-Suk Seo (U Maryland). CosmicSAG will work towards producing a white paper covering:

- the major open science questions
- a brief survey of the current and planned, US and International, space and ground-based projects — their energy coverage (from about  $10^8$  eV to  $10^{20}$  eV), sky coverage, and particle type coverage (electrons, positrons, nucleons, anti-nucleons, nuclei, anti-nuclei, neutrinos, and new particles)
- a survey of the state-of-the-art capabilities, the next generation technology needs, and potential science return from new technologies and capabilities
- a vision for the future of cosmic ray science in space

The CosmicSAG is open to all members of the community.

If you are interested in contributing to the work of the CosmicSAG, please subscribe using the link below. For other inquiries, e-mail Angela Olinto, chair of the CosmicSAG, at [olinto@uchicago.edu](mailto:olinto@uchicago.edu)

**CosmicSAG Mailing List**

Subscribe to the [CosmicSAG mailing list](#).

**Program News**

**03 Apr 2013**  
PCOS/PhysPAG Town Halls:  
April 9 at HEAD, April 16 at  
APS. » [Details](#)

**03 Apr 2013**  
Upcoming XRSAG Meeting:  
Friday, April 12th @ HEAD. »  
[Details](#)

**01 Mar 2013**  
New Astrophysics Roadmap to  
be developed by a task force of  
the NASA Advisory Council's  
Astrophysics Subcommittee  
during 2013. » [Details](#)

**Project News**

**Chandra News**  
**18 Mar 2013**  
Famous Supernova Reveals  
Clues About Crucial Cosmic  
Distance Markers » [Details](#)

**Fermi News**  
**27 Feb 2013**  
Fermi's Motion Produces a  
Study in Spirograph » [Details](#)

**Planck News**  
**21 Mar 2012**  
Planck Reveals an Almost  
Perfect Universe

# Cosmic Rays Recent Highlights - Space

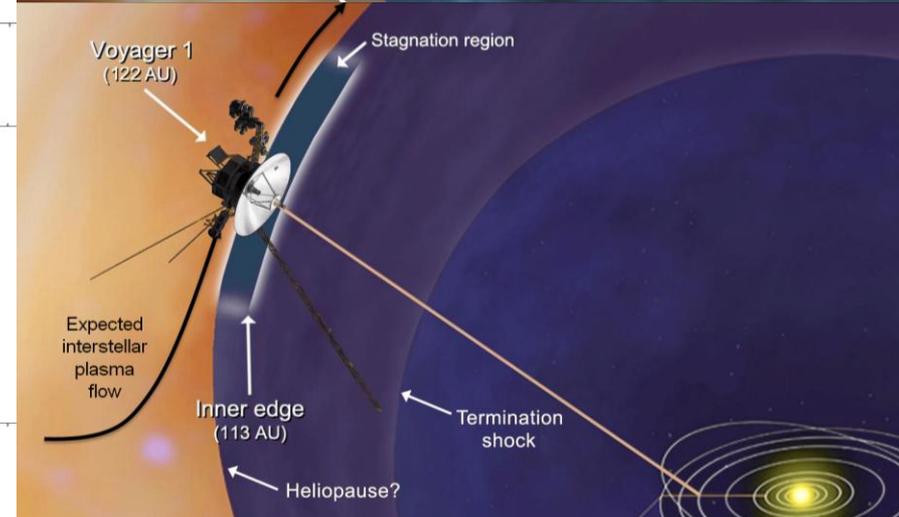
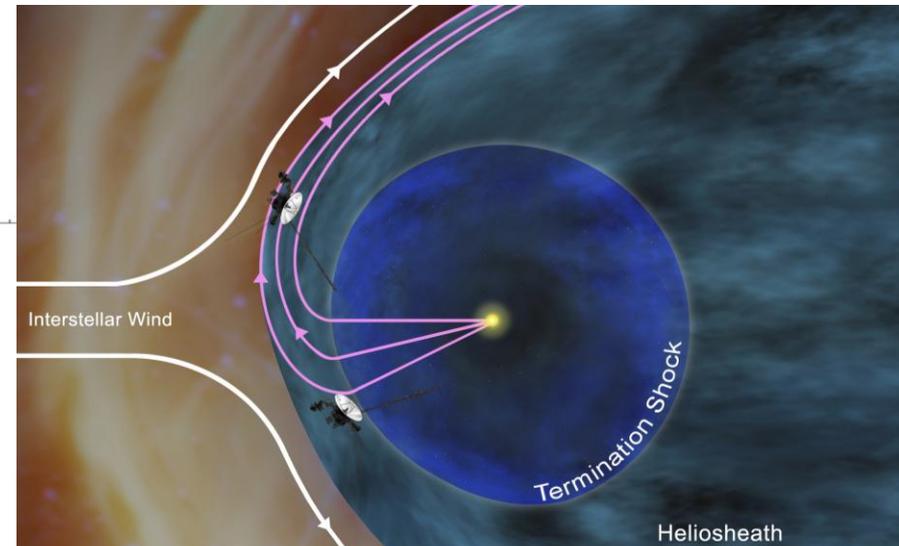
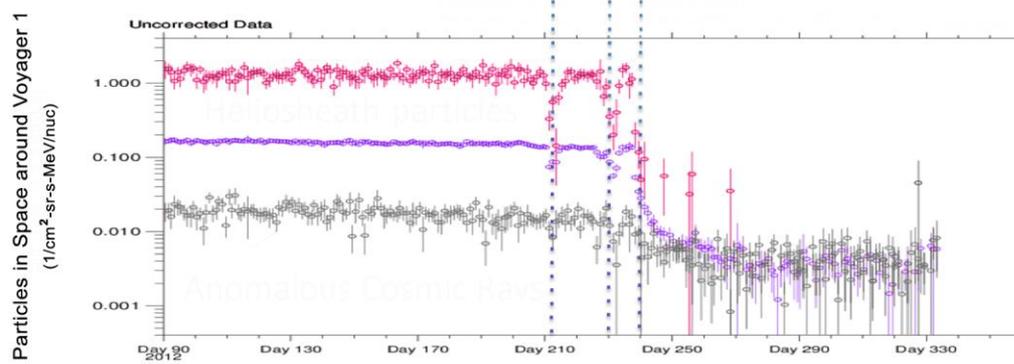
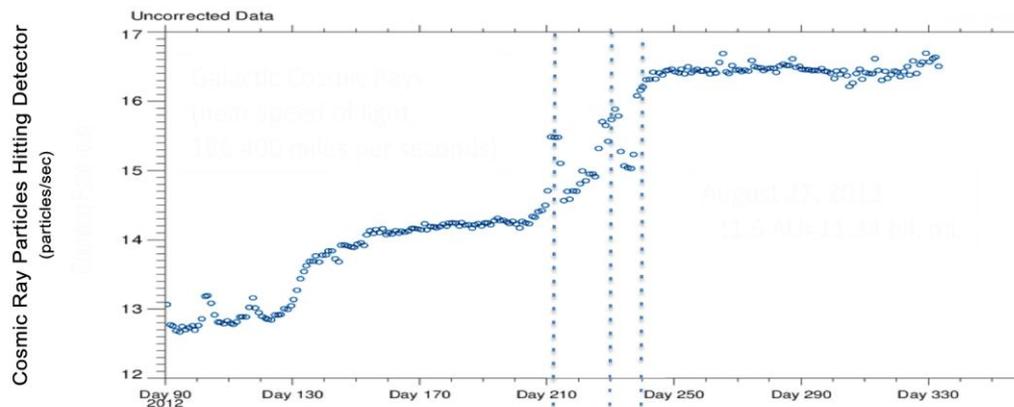
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# Cosmic Rays Recent Highlights (Dec. 2012)

- ▶ Voyager 1 reaches 'the magnetic highway'
- ▶ On its way to interstellar space

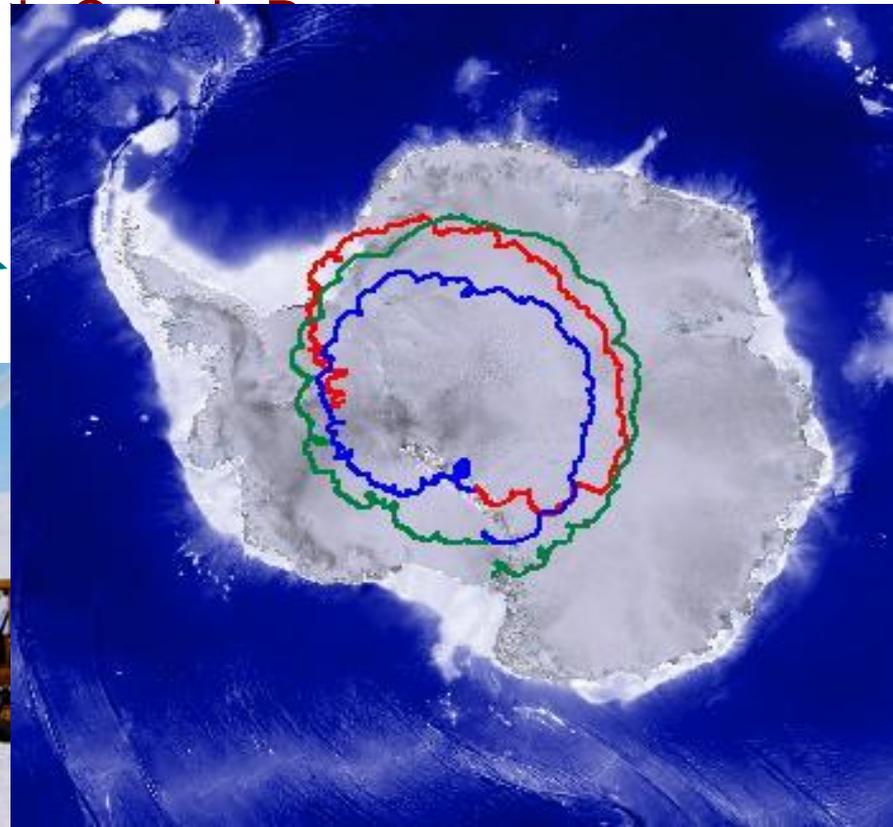
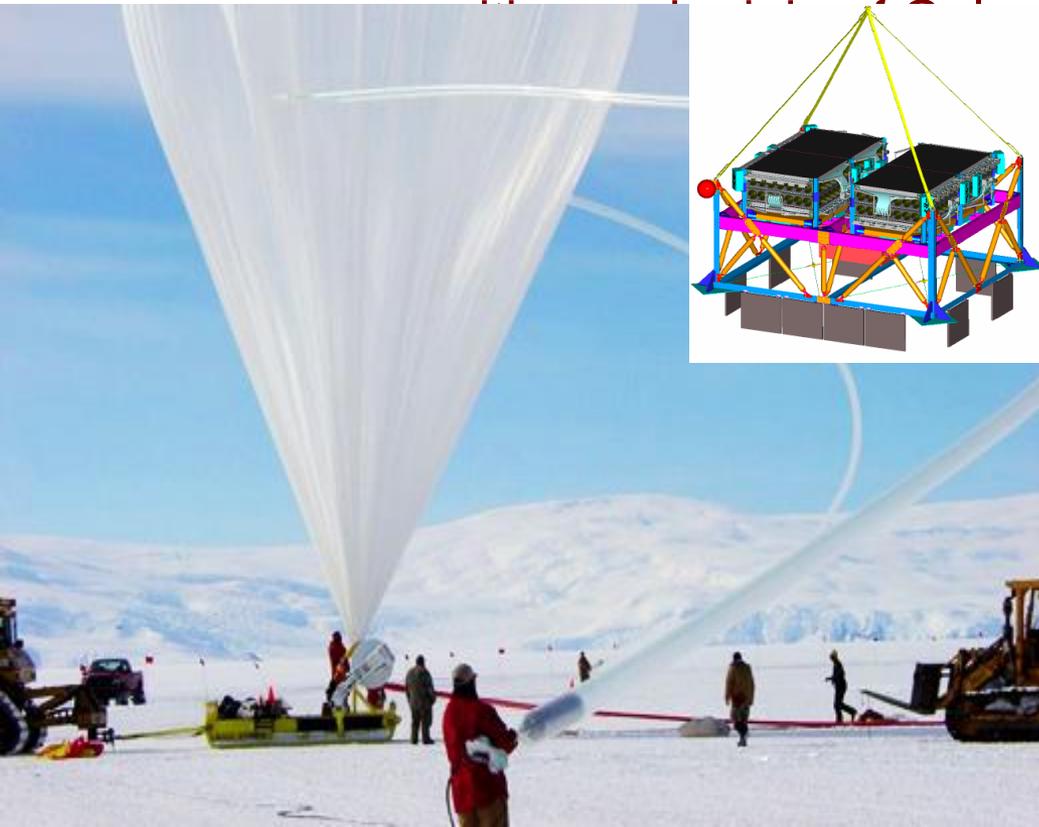
Voyager 1 Low-Energy Charged Particle Instrument



# Cosmic Rays Recent Highlights (Feb. 2013)

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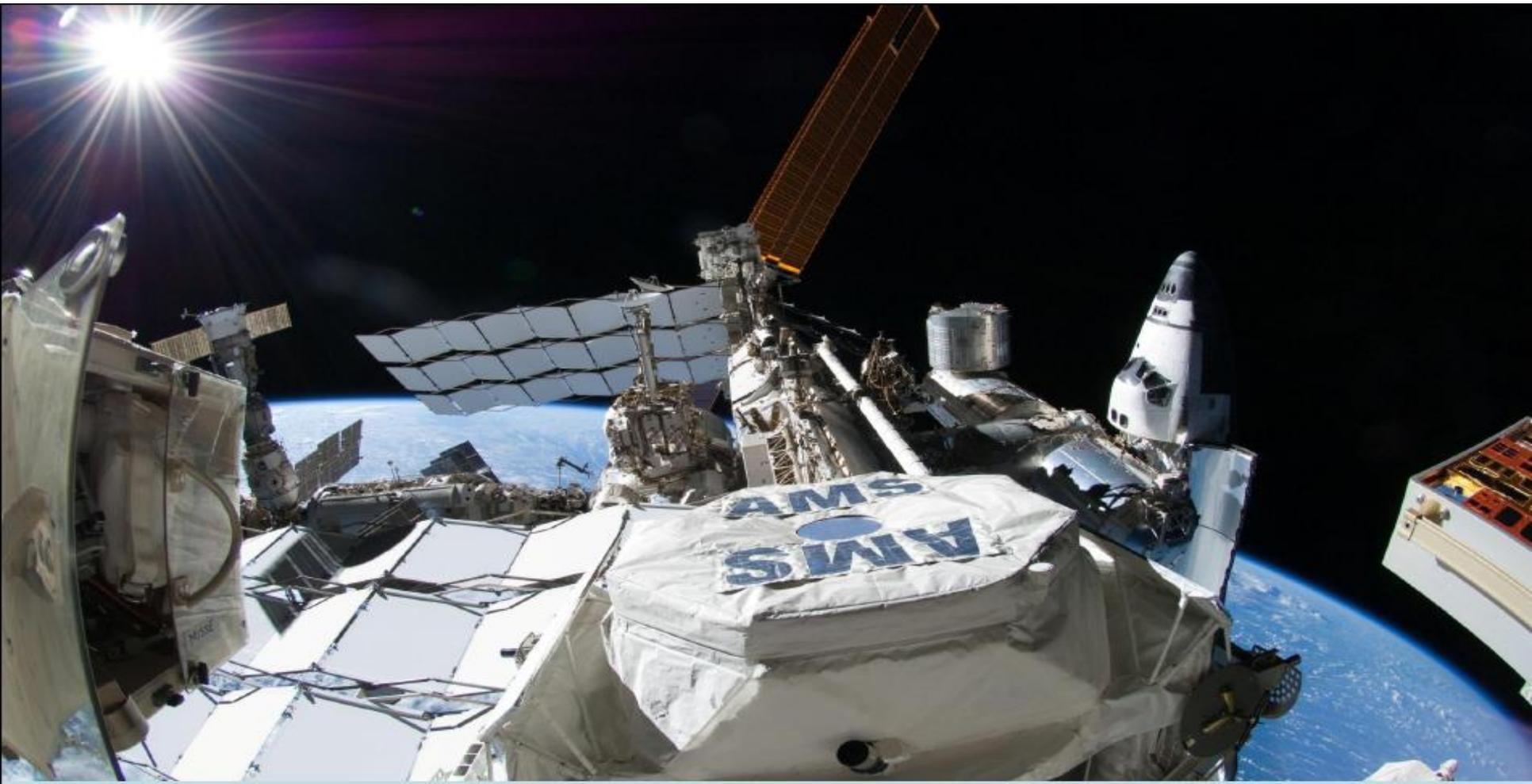
- ▶ Super-TIGER (Trans-Iron Galactic Element Recorder) breaks flight duration record: 55 days at 127,000 feet
  - ▶ Increase on UltraHeavy Nuclei data by 1 o.o.m. to study



# Cosmic Rays Recent Highlights (Mar. 2013)

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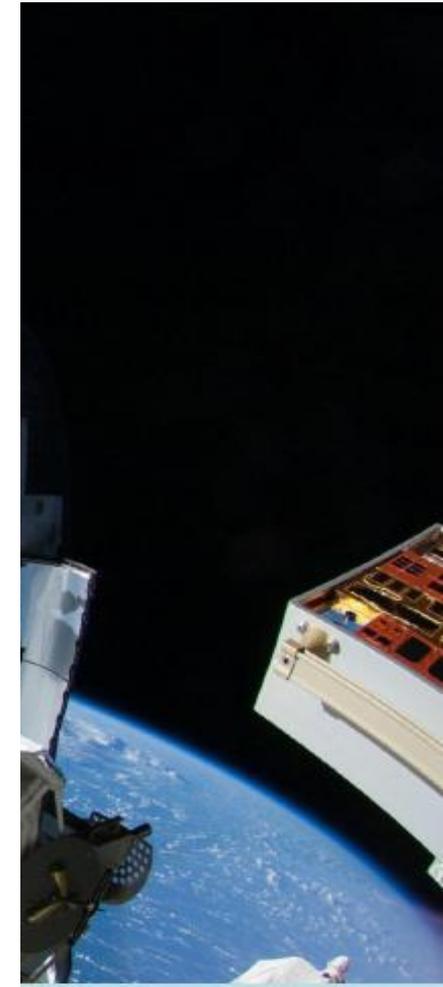
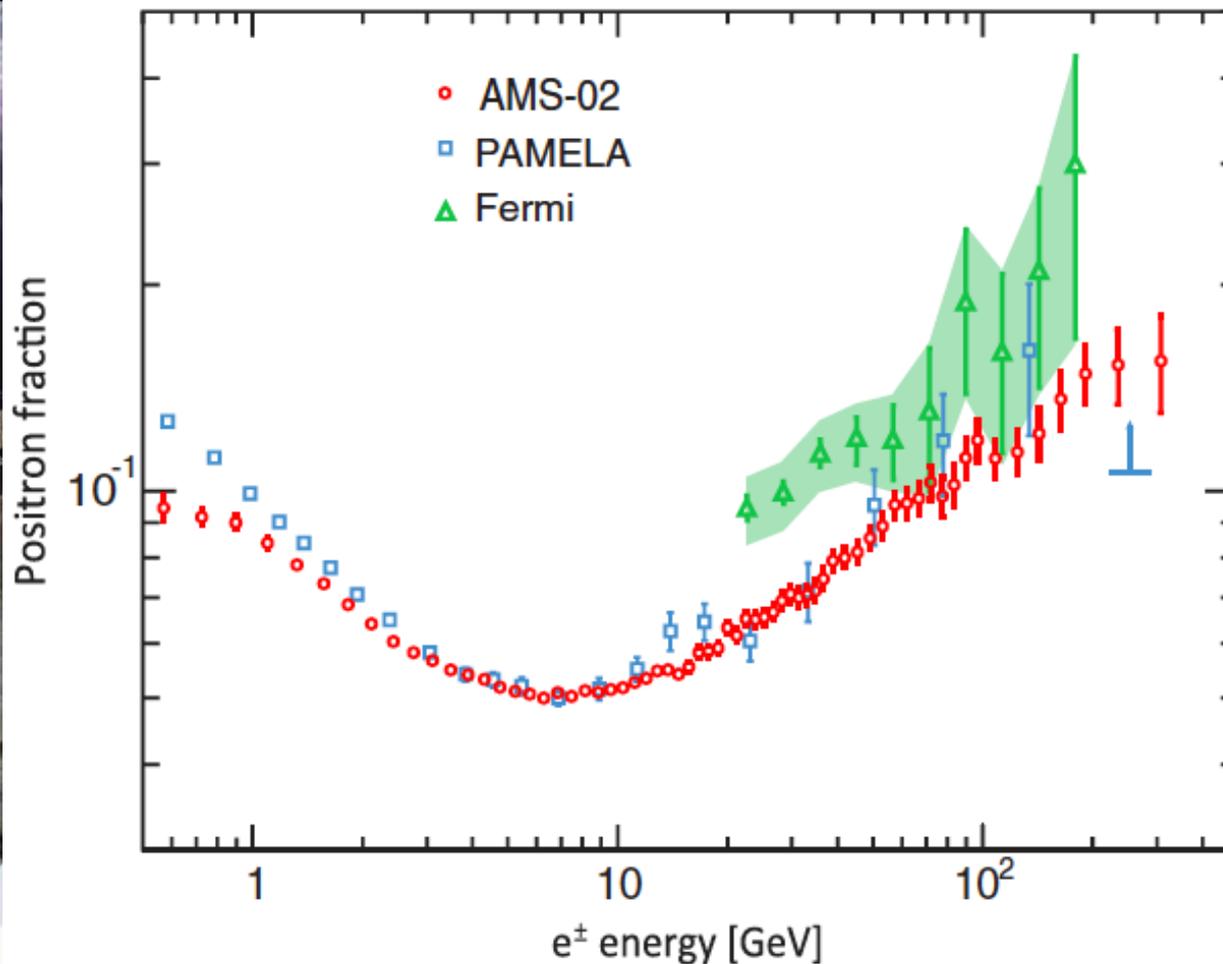
- ▶ AMS (Alpha Magnetic Spectrometer) on the ISS announces first results

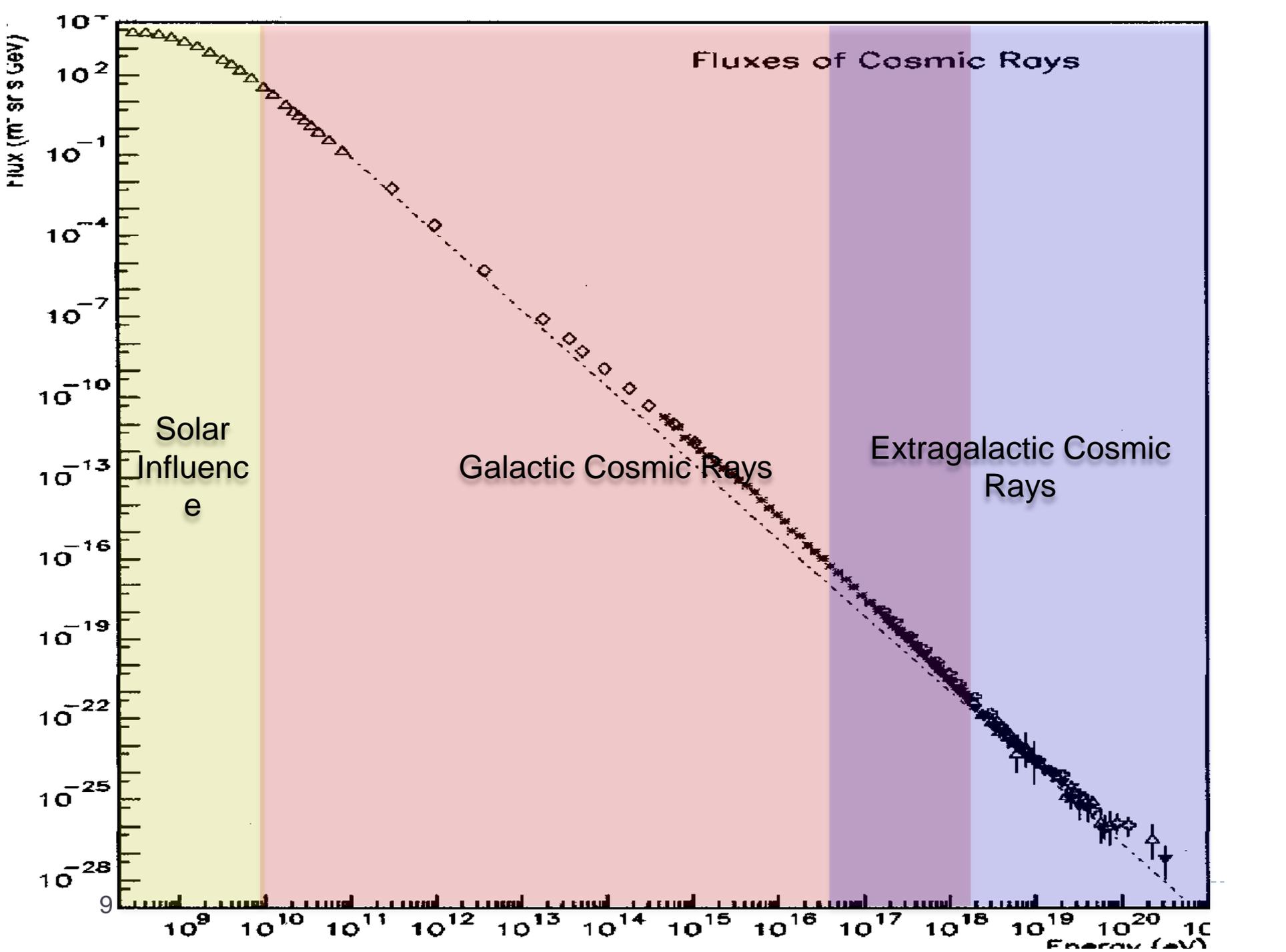


# Cosmic Rays Recent Highlights (Mar. 2013)

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PRL 110, 141102 (2013)





# Main Open Questions in CR Science

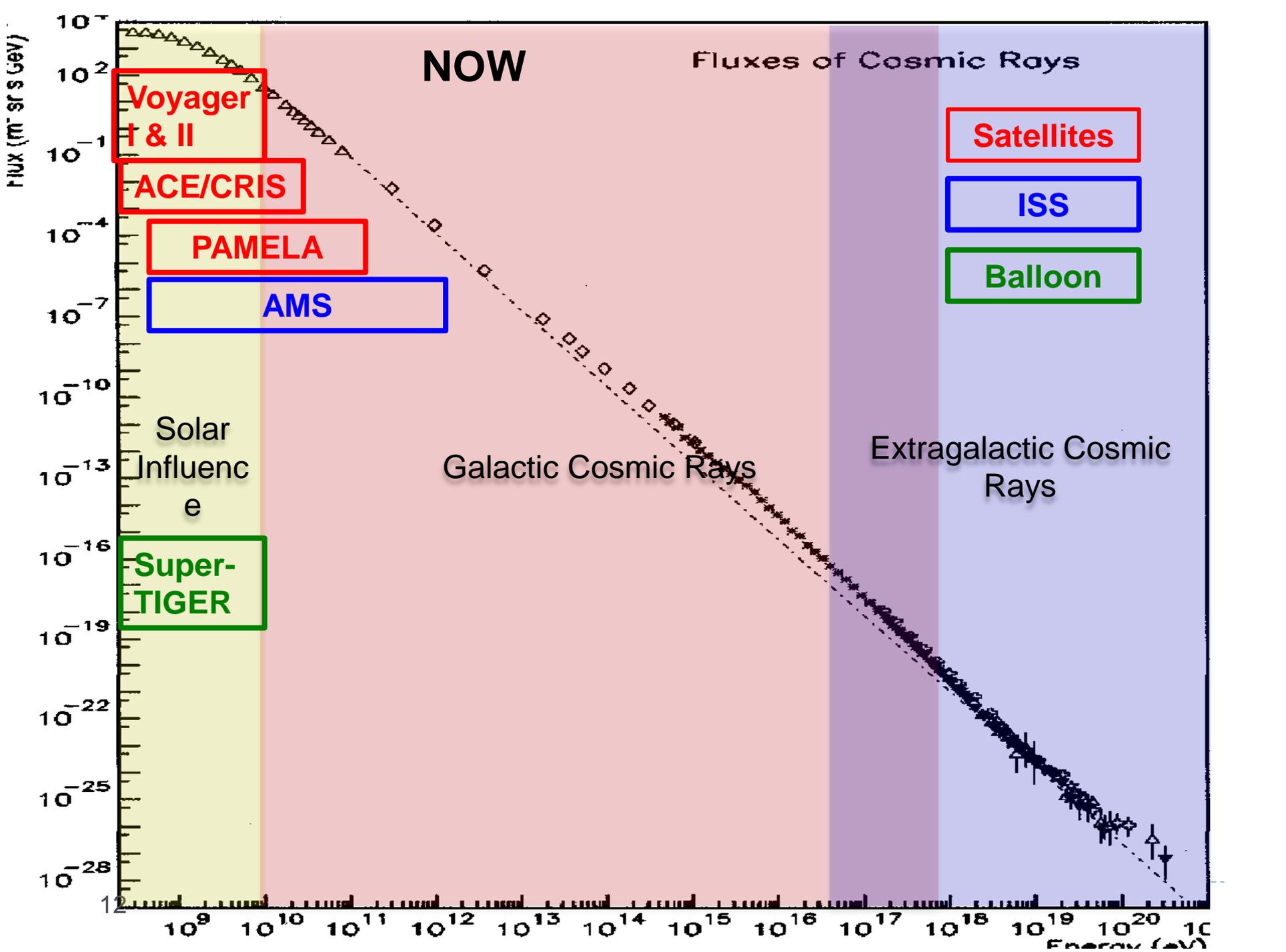
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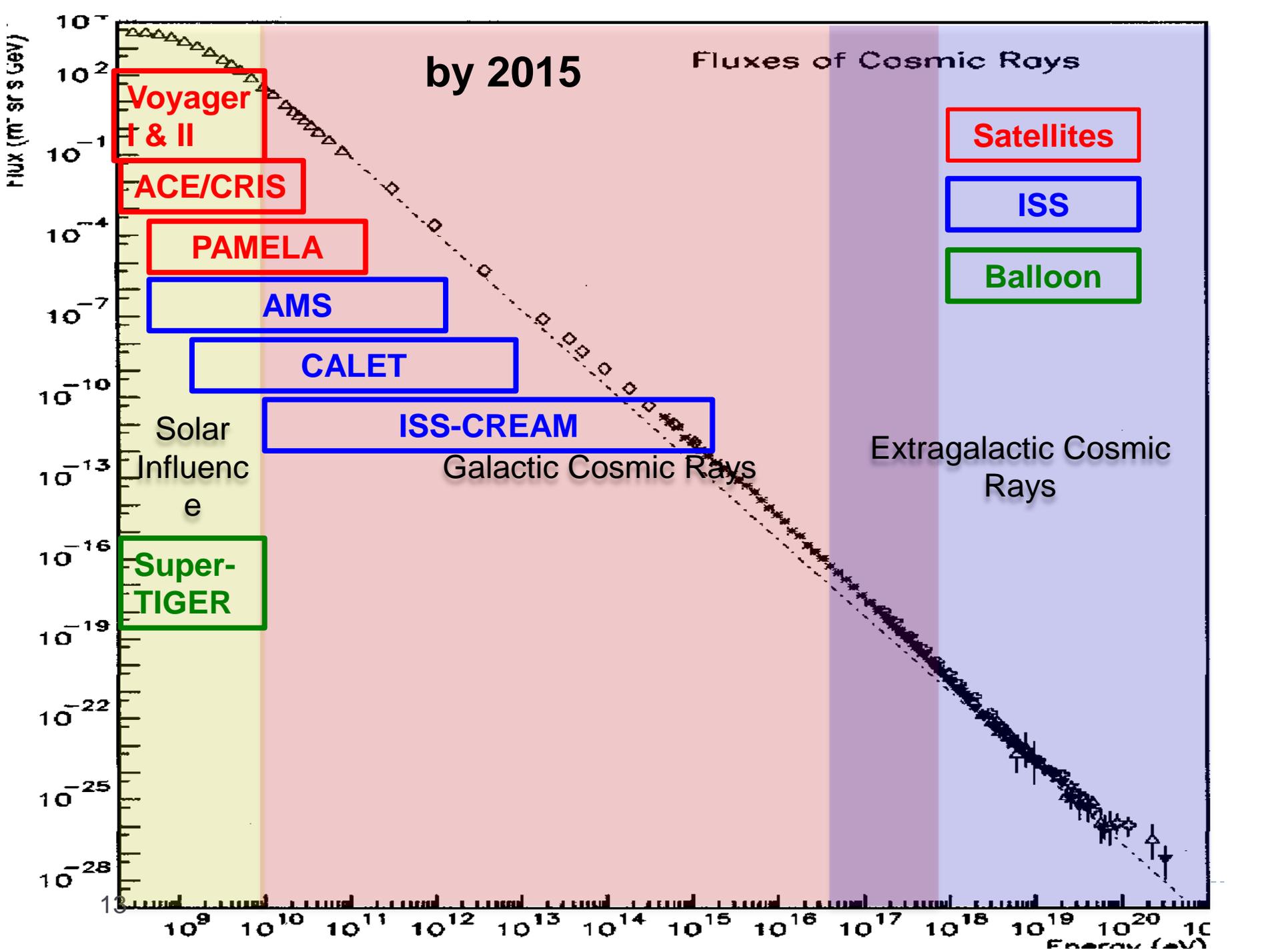
- ▶ **Origin of Galactic Cosmic Rays (GCR):**
  - ▶ What are the accelerators?
  - ▶ What are they accelerating?
  - ▶ How do they propagate in the Galaxy?
  - ▶ Where is the Transition between Galactic & ExtraGalactic CRs?
- ▶ **Origin of ExtraGalactic Cosmic Rays (XGCR):**
  - ▶ What are the accelerators?
  - ▶ What are they accelerating?
  - ▶ How do they propagate to Earth?
  - ▶ At what Energy COSMIC RAY ASTRONOMY begins?
- ▶ **How do Cosmic Rays Affect the Earth, the Solar System, the Galaxy, other Galaxies, and the formation of Stars and Galaxies?**

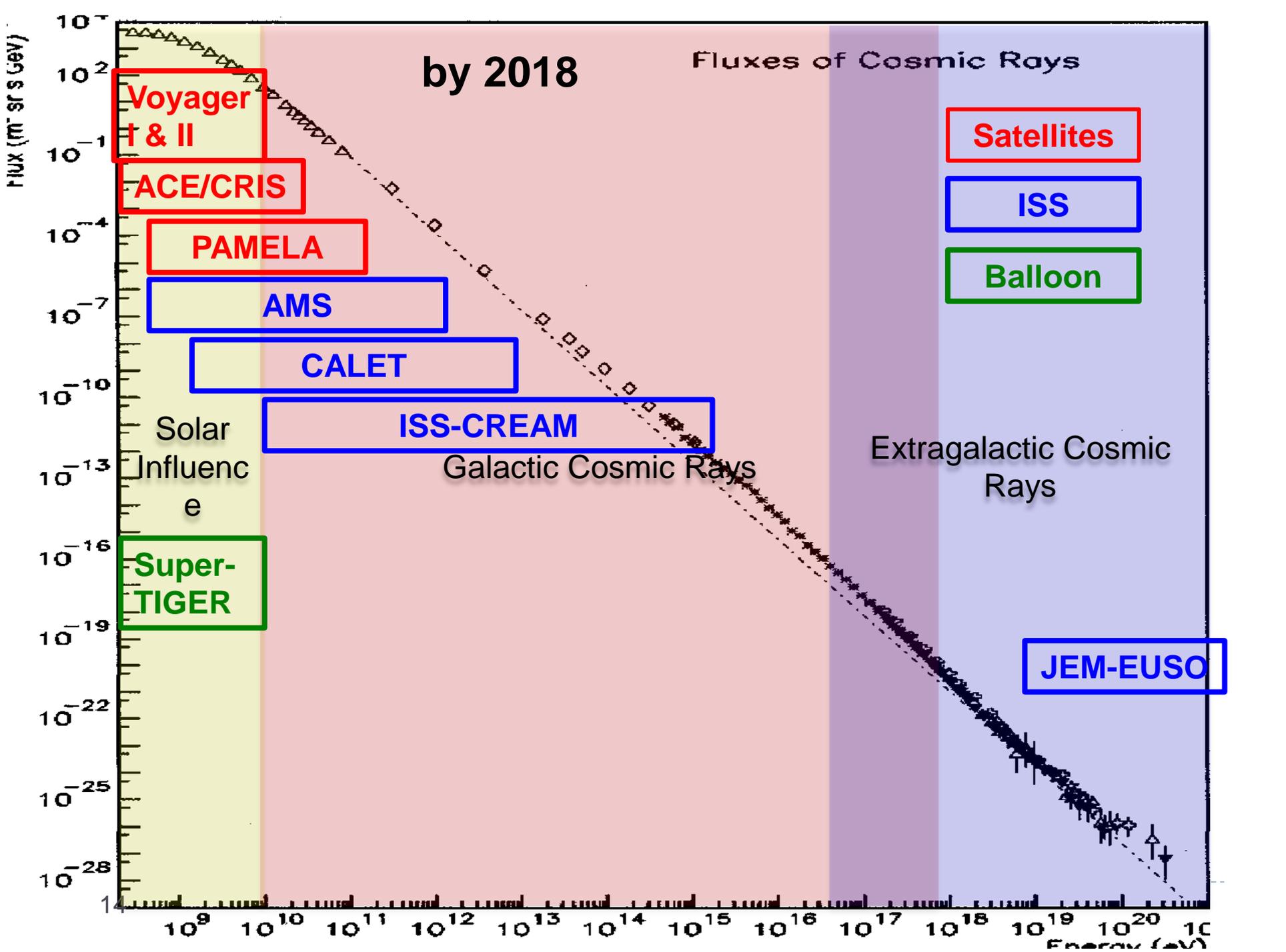
# Questions Related to CR Science

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- ▶ Indirect Dark Matter Searches
  - ▶ WIMP in the Galactic Halo:  $e^+$ ,  $e^-$ ;  $p$ , anti- $p$ ,  $\gamma$ ,  $\nu$ ...
- ▶ Probe of Particle Interactions above LHC energies
  - ▶ Ultrahigh Energy Cosmic Rays (UHECR)  $E_{\text{cm}} > 100 \text{ TeV}$
  - ▶ Ultrahigh Energy Neutrinos
- ▶ Searches for Exotic Components of Matter:
  - ▶ antinuclei
  - ▶ strangelets
  - ▶ primordial black holes







# Opportunities in Space

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- ▶ In Situ Measurements of Solar System
  - ▶ Voyager I & II
- ▶ Ultra Heavy Nuclei
  - ▶ ACE/CRIS
  - ▶ Super-TIGER
- ▶ Precise Measurements from GeV to TeV
  - ▶ PAMELA
  - ▶ AMS
  - ▶ CALET
- ▶ Galactic Cosmic Rays up to the knee
  - ▶ CREAM, TRACER
  - ▶ ISS-CREAM
- ▶ Extragalactic Cosmic Rays
  - ▶ JEM-EUSO
  - ▶ OWL/PATEL

# Space Opportunities for Cosmic Ray Science



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